I R T Electronics Pty Ltd A.B.N. 35 000 832 575
26 Hotham Parade, ARTARMON N.S.W. 2064 AUSTRALIA
National: Phone: (02) 9439 3744 Fax: (02) 9439 7439
International: +61 2 9439 3744 +61 2 9439 7439
Email: sales@irtelectronics.com
Web: www.irtelectronics.com

IRT Eurocard

Type MTG-9100

ASI/G.703 Error Detecting Test Set

Designed and manufactured in Australia

IRT can be found on the Internet at:
http://www.irtelectronics.com

IRT Eurocard

Type MTG-9100

ASI/G.703 Error Detecting Test Set

Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0305001.

Operational Safety:

WARNING

Operation of electronic equipment involves the use of voltages and currents that may be dangerous to human life. Note that under certain conditions dangerous potentials may exist in some circuits when power controls are in the **OFF** position. Maintenance personnel should observe all safety regulations.

Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

IRT Eurocard
Type MTG-9100
ASI/G.703 Error Detecting Test Set

General Description

The MTG-9100 is a test set for checking the integrity of ASI and E3 or DS3 G.703 links. MTT-9100 generator and MTR-9100 analyser modules are housed in a portable carrying case with all signal connections, monitoring and controls accessible on the front panel.

The generator can accept an ASI signal from 2 Mb/s to 50 Mb/s, 188 or 204 byte packets. 188 to 204 byte conversion is automatically performed and Reed Solomon coding added/replaced. Interleaving and energy dispersion (scrambling) are front panel switch selectable.

Encoded ASI and G.703 signals are provided for connecting to the relevant link. The G.703 output rate is set to either E3 or DS3 by the front panel switch on the MTR-9100 module. With G.703 payload switch set to variable (VAR), byte stuffing of the input signal will take it up to the selected G.703 rate. With G.703 payload switch set to FULL, the input ASI rate must be at the correct E3 or DS3 rate for a 204 byte signal (accounting for 188 to 204 conversion if the input is 188).

If no ASI input, the MTG-9100 generates a DVB compliant transport stream output at 34.368 Mb/s, 44.736 Mb/s or 24.0 Mb/s (VAR).

An Inject Error switch allows a deliberate correctible error to be transmitted to confirm correct link connection (link setting allows uncorrectible error to be inserted).

The analyser accepts (from the link under test) either an encoded ASI or G.703 test signal. Input is switch selected for ASI, G.703 F (full) or G.703 V (variable). For receiving G.703 signals, the input switch must be set to match that of the transmitter module (unless appropriate processing exists between the units).

Front panel LEDs indicate loss of signal, loss of sync, correctable and uncorrectable errors, presence of a 188 byte signal (as opposed to a 204 byte signal), presence of scrambling, Reed Solomon encoding and interleaving.

The output signal is ASI and is automatically descrambled with the option of de-interleaving by a front panel switch.

An RS-232 port allows connection to a computer for monitoring via supplied software.

A voltage selector switch on the power supply module allows the unit to be configured for 240V, 220V, 130V or 110V AC operation.

Standard features:

- **Reed Solomon encoded ASI generator.**
- **E3 or DS3 output available.**
- **Reed Solomon encoding of external 188 or 204 byte ASI streams.**
- **Analyser inputs either ASI or E3/DS3.**
- **Error injection button on generator.**
- **RS232 output for logging purposes.**
- **Indication of Correctable and Uncorrectable errors.**

Technical Specifications

Type MTG-9100

MTT-9100 Generator:

Input:

Type	1 x ASI, 75Ω BNC connector.
ASI Payload Rate	2 Mb/s to 50 Mb/s.

Output:

Type	1 x ASI-C 75Ω, 800 mVp-p, BNC connector. 1 x G.703, 75Ω BNC connector, E3 or DS3, selectable by switch position on MTR-9100, byte stuffed or full, dependent on G.703 payload switch setting.

Indicators:

DC	LED (green) for +5 Vdc power.
ASI IN	LED (green) when input ASI signal present.
Sync	LED (red) when no input ASI, not valid TS.
E3	LED (green) when valid G.703 at E3 rate is output.
DS3	LED (green) when valid G.703 at DS3 rate is output.
188	LED (green) when a 188 byte ASI signal is input.
204	LED (green) when a 204 byte ASI signal is input.
SCR	LED (green) when input signal is scrambled.
INT	LED (red) when input signal is interleaved (generator requires non-interleaved ASI input).

MTR-9100 Analyser:

Input:

Type switch selectable	1 x ASI-C 75Ω, 800 mVp-p, BNC connector. 1 x G.703, 75Ω BNC connector, E3 or DS3, byte stuffed or full.

Output:

Type	1 x ASI, 75Ω BNC connector.

Indicators:

DC	LED (green) for +5 Vdc power.
INPUT	LED (red) when current selected input is not present.
SYNC	LED (red) when selected input is not a valid MPEG TS.
cERR	LED (amber) when correctible error is received.
ucERR	LED (red) when uncorrectible error is received.
188	LED (red) when a 188 byte ASI signal is input (analyser requires 204 byte TS with RS).
SCR	LED (green) when input signal is scrambled.
RS	LED (green) when input signal is Reed Solomon encoded.
INT	LED (green) when input signal is interleaved.

Logging Connection:

Type	RS-232, 9 pin D-connector, 9600 BAUD.

Power requirement:

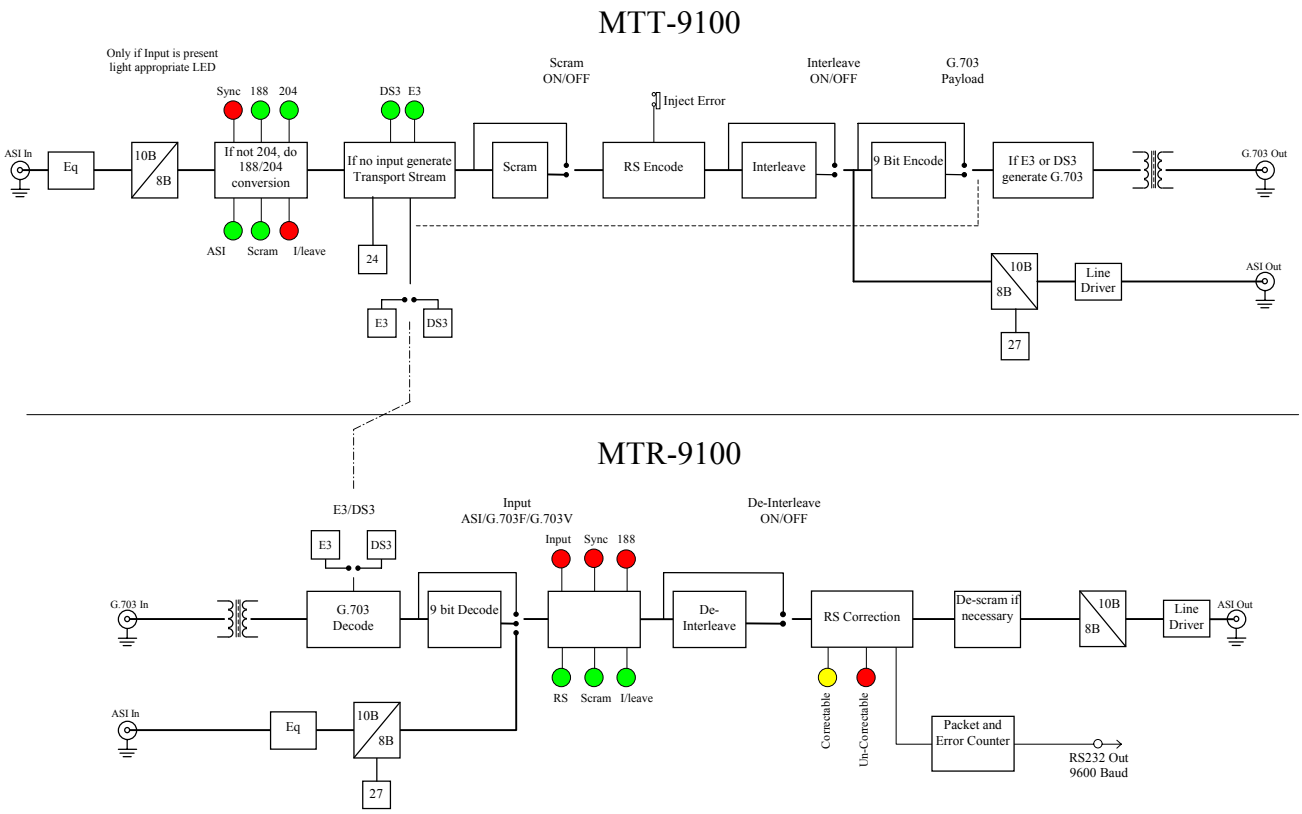
Voltage	240 Vac, 220 Vac, 130 Vac, 110 Vac switch selectable.

General:

Temperature range	0 - 50° C ambient
Dimensions	260 x 160 x 345 mm, plus handle.
Weight	6.6 kg.
Finish:	Front panel Grey background, black lettering & red IRT logo
Supplied accessories	Monitoring Software.

Due to our policy of continuing development, these specifications are subject to change without notice.

Technical Description



The MTG-9100 Error Detecting Test Set consists of a transmitter module, MTT-9100, and a receiver module, MTR-9100, housed in a carry case frame with a plug in power supply module, PSU-9100. All signal connections are made via a front panel connector plate.

The MTT-9100 transmitter module and the MTR-9100 receiver module run independently of each other with the exception of the G.703 rate switch selector on the MTR-9100, which also controls the MTT-9100 G.703 rate.

MTT-9100 transmitter module

The MTT-9100 transmitter module accepts an ASI signal, via the MTG-9100 front panel, with a payload rate from 2 Mb/s to 50 Mb/s, 188 or 204 byte packet length. The signal is then equalised to compensate for input cable lengths up to 300m and then deserialised. Front panel LEDs indicate the presence of ASI input, whether the input signal is a 188 or 204 byte packet length signal, and if the input is a valid MPEG Transport Stream (sync).

If the input signal has a packet length of 188 it is automatically converted to 204 byte length. Reed Solomon encoding is added and this is used at the Receiver to determine when any errors have occurred. If the input signal already has Reed Solomon encoding, this is stripped off and replaced with the new Reed Solomon encoding.

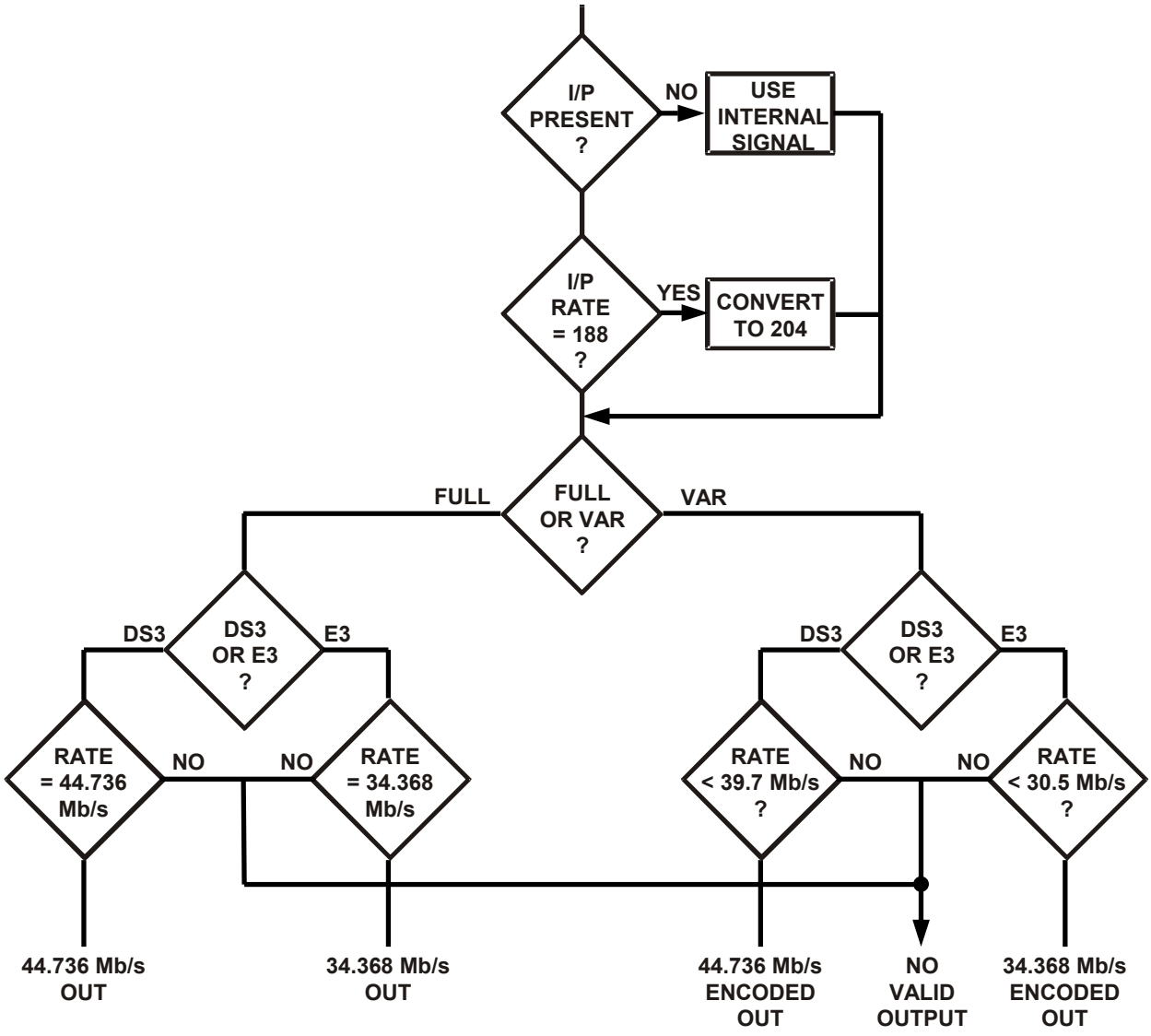
If there is no ASI input, the MTT-9100 generates a DVB compliant ASI output transport stream at 34.368 Mb/s, 44.736 Mb/s or 24.0 Mb/s (VAR), dependent on the front panel G.703 payload switch and on the front panel G.703 E3/DS3 rate switch on the MTR-9100 receiver module. The MTT-9100 generates a G.703 output at either E3 or DS3 depending on the E3/DS3 rate switch on the MTR-9100.

Correctable errors can be injected into the signal (using the Inject Error Switch), which will be detected and corrected in the Receiver module. This acts as a check that a link under test is actually working and is the correct link under test.

Front panel switches allow the option of scrambling and interleaving of the signal. Front panel LEDs indicate whether the signal has been scrambled or interleaved. Note that the term scrambling does not refer to security encoding (encryption) of the signal, it refers to energy dispersal or randomisation of the bit stream.

This encoded/scrambled (if selected)/interleaved (if selected) signal is transmitted as both ASI and G.703. The G.703 rate is set by the rate switch position on the Receiver module. The MTT-9100 also has a front panel switch, which sets whether the G.703 payload is at the full or variable rate. If set to the full rate then the input signal must be at the full E3 or DS3 rate for a 204 byte signal, if set to the variable rate then the input rate is automatically byte stuffed to the correct E3 or DS3 rate depending on which G.703 rate has been selected. Front panel LEDs indicate the selected G.703 rate.

MTT-9100
G.703 Output logic



MTR-9100 receiver module

The MTR-9100 receiver module accepts either a Reed Solomon encoded ASI signal or an E3 or DS3 G.703 signal at the full rate or a variable encoded rate via the MTG-9100 front panel. The input type is selected by a front panel selection switch.

The input signal is first equalised to compensate for cable losses and then deserialised for processing. Front panel LEDs indicate the absence of an input, loss of sync, and whether the input signal is Reed Solomon encoded, scrambled or interleaved. If the signal is interleaved the De-interleave front panel switch should be selected for proper operation.

The signal is then Reed Solomon decoded and corrected. Any errors, whether they be correctible or uncorrectible, are reported via an RS232 port to a computer running the logging software MTG-9100.EXE. As the MTR-9100 uses Reed Solomon error correction, the input signal must be 204 byte packet length Reed Solomon encoded. If the input signal is a 188 byte packet length, the signal is not Reed Solomon encoded and a front panel LED will indicate an alarm condition that the signal is in fact a 188 byte signal.

After the signal is Reed Solomon corrected, the signal is automatically descrambled, if it was scrambled in the first place, and then transmitted as ASI.

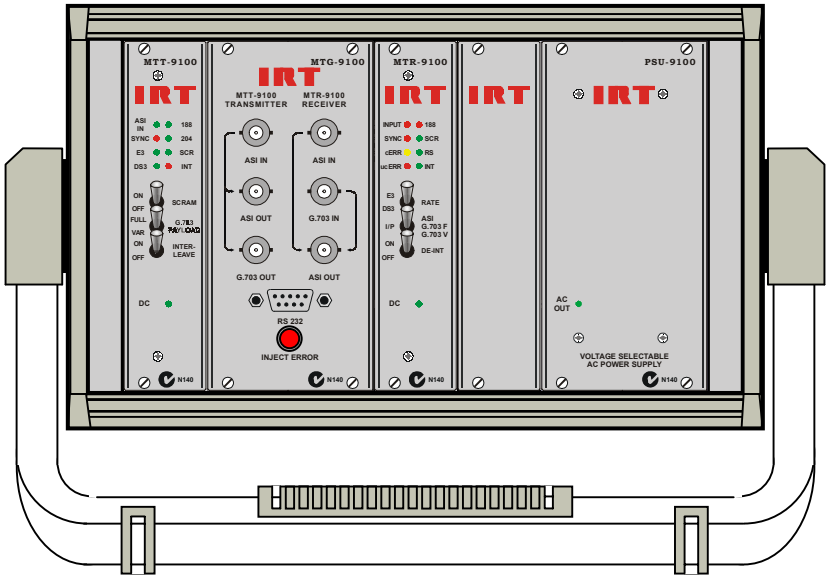
Configuration

Other than the front panel switch positions as described in the operations section of this manual, all internal link settings are factory set and should not be changed.

Operation

Front panel layout

The following front panel drawing is not to scale and is intended to show connection order and approximate layout only.



The MTG-9100 error detecting test set is primarily intended for testing the integrity of ASI, E3 or DS3 G.703 links. By logging errors at various points in a signal chain it is possible to isolate faults and to determine the error generating equipment.

The MTG-9100 consists of a Transmitter module and a Receiver module. Ideally two test sets are needed to test a link, one for each end, although if a return path is available then one unit may test the integrity of both links cascaded.

All signal connections are made via front panel BNC connectors. There is also a 9 pin RS232 port for connecting to a computer running the MTG-9100.EXE monitoring program.

Power to the unit is via an IEC input socket at the rear of the unit. A removable rear faceplate covers the mains input. Block diagrams of the units function appear inside this cover. A voltage selector switch on the side of the PSU-9100 power supply allows the unit to accept mains voltages of 240 Vac, 220 Vac, 130 Vac, or 110 Vac. The power supply must be removed by undoing the four front mounting screws and sliding the unit out towards the front.

The MTT-9100 transmitter module and MTR-9100 receiver module act independently from each other with the exception of the E3/DS3 G.703 rate for both modules being set by a front panel toggle switch on the MTR-9100 module.

MTT-9100 Operation

The MTT-9100 transmitter module accepts, via a BNC connector, an ASI input signal with a payload rate from 2 Mb/s to 50 Mb/s. The signal can be either a 188 byte or 204 byte packet length but must not be interleaved. Front panel LEDs indicate various signal characteristics:

DC	LED (green) for +5 Vdc power.
ASI IN	LED (green) when signal present on ASI input.
Sync	LED (red) when no valid input signal present.
E3	LED (green) when valid E3 signal is output.
DS3	LED (green) when valid DS3 signal is output.
188	LED (green) when a 188 byte ASI signal is input.
204	LED (green) when a 204 byte ASI signal is input.
SCR	LED (green) when input signal is scrambled.
INT	LED (red) when input signal is interleaved.

Two outputs are provided for connection to either an ASI or G.703 link path. Front panel toggle switches set output parameters:

SCRAM	ON	Set to ON when output signal to be scrambled (energy dispersed).
	OFF	Set to OFF when output signal not to be scrambled.
G.703 PAYLOAD	FULL	Set to FULL if input rate at desired correct selected G.703 output rate.
	VAR	Set to VAR when input rate is less than desired selected G.703 output rate.
INTERLEAVE	ON	Set to ON when output signal to be interleaved.
	OFF	Set to OFF when output not to be interleaved.

Desired output G.703 rate (E3 or DS3) is set by the RATE toggle switch on the MTR-9100 module. This switch sets the desired rate for both the MTT-9100 and the MTR-9100.

If the output G.703 signal is required to be at the full E3 or DS3 rate, so that signal can be converted by third party G.703 converters, the G.703 PAYLOAD switch must be set to FULL and the input ASI signal must be at the correct selected E3 or DS3 rate. This corresponds to:

Selected G.703 (FULL) Output Rate	**ASI Input Rate**	
	188 Byte packet length	**204 Byte packet length**
E3	31.672 Mb/s	34.368 Mb/s
DS3	41.227 Mb/s	44.736 Mb/s

If the ASI byte rate is less than the full E3 or DS3 rate, with the G.703 PAYLOAD switch set to VAR (variable), the signal is bit stuffed to the selected G.703 output rate. This cannot be converted back to ASI using third party G.703 converters but is converted using the receiver side of the MTG-9100 test set. The maximum ASI input rate allowable using the VAR position to give a valid G.703 output is as follows:

Selected G.703 (VAR) Output Rate	**Maximum ASI Input Rate**	
	188 Byte packet length	**204 Byte packet length**
E3	27.647 Mb/s	30 Mb/s
DS3	35.941 Mb/s	39 Mb/s

When there is no input signal applied to the MTT-9100 transmitter module, with the G.703 PAYLOAD switch set to FULL, a DVB compliant transport stream is generated at both the ASI and G.703 output ports at the selected E3 or DS3 G.703 rate. With the G.703 PAYLOAD switch is set to VAR, with no input, a 24.0 Mb/s DVB compliant transport stream is generated at the ASI output and byte stuffed to the selected E3 or DS3 G.703 rate at the G.703 output. A front panel LED indicates the presence of a valid E3 or DS3 G.703 output.

Reed Solomon encoding is automatically added to the input/generated stream. This is used by the receiver module for detecting and correcting errors. The input stream can either be a 188 or 204 byte signal. If it is a 188 byte signal, it is automatically converted to 204 bytes so that Reed Solomon encoding can be performed. If the input signal is already Reed Solomon encoded, the existing Reed Solomon bits are stripped and replaced with new encoding bits.

It doesn't matter whether the input stream is scrambled or not, however the input stream must not be interleaved. A red alarm LED on the front panel indicates if the input signal is not suitable.

MTR-9100 Operation

The MTR-9100 transmitter module accepts both an ASI Reed Solomon encoded 75Ω BNC input signal and an E3 or DS3 G.703 full rate or bit stuffed signal, as generated by the MTT-9100 transmitter module. G.703 rate and choice of inputs are made by front panel toggle switches. Front panel LEDs indicate various signal characteristics:

DC	LED (green) for +5 Vdc power.
INPUT	LED (red) when no signal for selected input is present.
SYNC	LED (red) when no valid signal for selected input is present.
cERR	LED (amber) when correctible error is received.
ucERR	LED (red) when uncorrectible error is received.
188	LED (red) when a 188 byte ASI signal is input.
SCR	LED (green) when input signal is scrambled.
RS	LED (green) when input signal is Reed Solomon encoded.
INT	LED (green) when input signal is interleaved.

A 204 byte ASI output is provided to pass on the original ASI stream injected into the transmitter end.

Front panel toggle switches set input and output parameters:

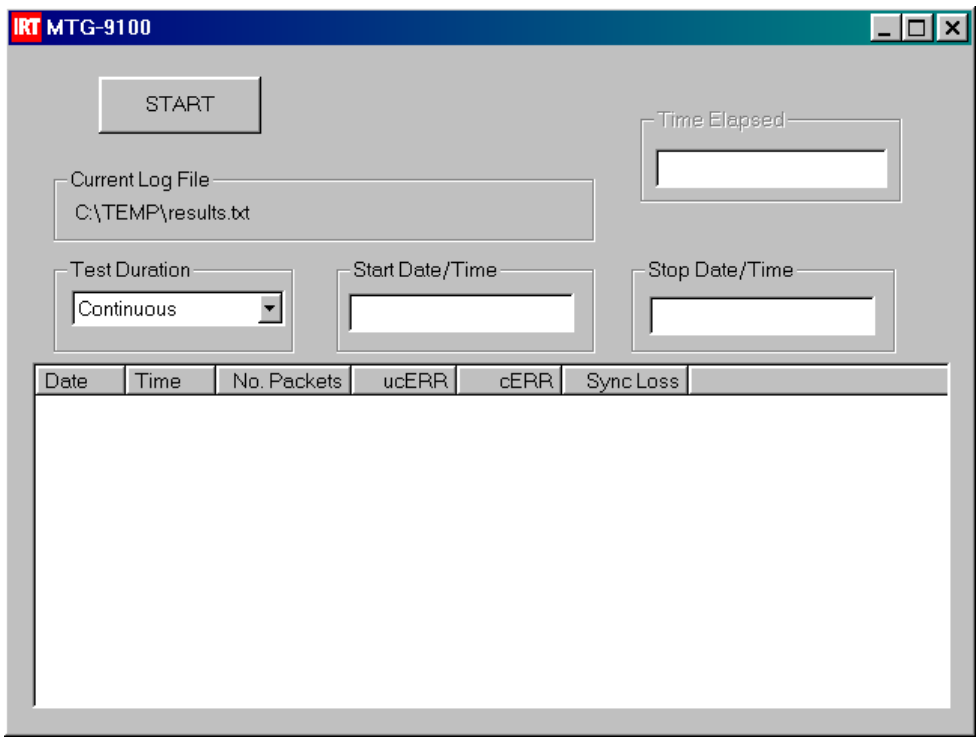
RATE	E3	Sets G.703 input rate to E3. Also sets the MTT-9100 transmitter module G.703 output rate to E3.
	DS3	Sets G.703 input rate to DS3. Also sets the MTT-9100 transmitter module G.703 output rate to DS3.
I/P	ASI	Set to select ASI input on MTR-9100.
	G.703F	Set to select full rate E3 or DS3 on G.703 input.
	G.703V	Set to select byte stuffed E3 or DS3 on G.703 input.
DE-INT	ON	If the input signal is interleaved, set to ON to de-interleave.
	OFF	If the input signal is not interleaved, set to OFF.

The input to the MTR-9100 receiver module expects a Reed Solomon encoded ASI or G.703 signal such as that generated by the MTT-9100 transmitter module. A Reed Solomon decode performs error correction. A front panel LED indicates if the input signal is Reed Solomon encoded. As Reed Solomon encoding can only be done on a 204 byte packet length stream, if the input signal is a 188 byte packet length a red alarm LED lights up to indicate an incompatible signal.

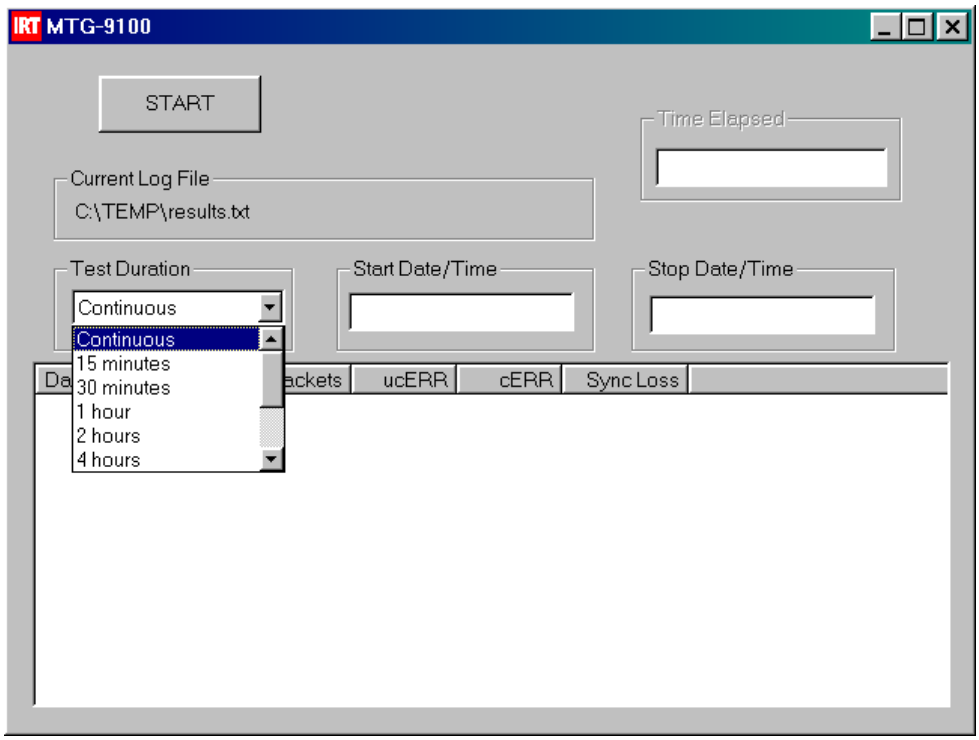
Errors are logged using a computer running the MTG-9100.exe monitoring program connected to the RS232 port on the front panel of the MTG-9100 connector panel (see monitoring software section). The occurrence of Correctible and Uncorrectible errors are also indicated by LEDs on the MTR-9100 front panel.

Monitoring Software

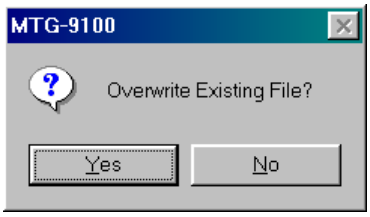
The MTG-9100 comes with accompanying monitoring software (MTG-9100.exe) for running under a "Windows" operating environment on a PC. When the program is started the following window appears:



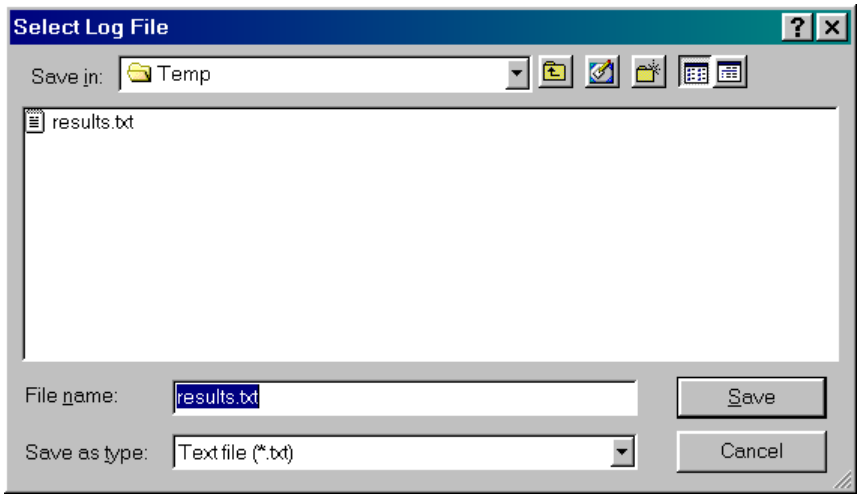
Features monitored are the start date & time of the test, the finish date & time of the test, the time elapsed from when the test was started, the date and time an error is encountered, the number of packets since the test was started, the number of correctable (cERR) & uncorrectable (ucERR) errors and sync losses that occur.
Test duration can be set from a pull down menu to be either Continuous (indefinite), 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 12 hours, 1 day, 2 days or 1 week.



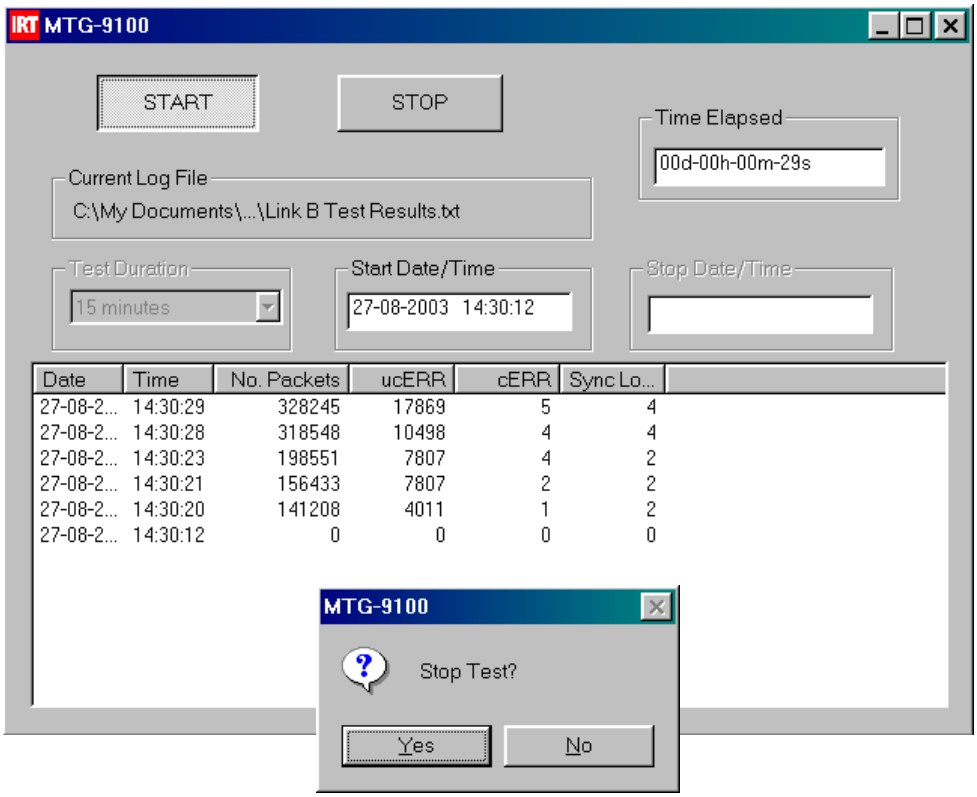
When the START button is clicked on, the program asks:



This is your results file saved as a text type of file (results.txt) capable of being opened with a text editor such as "Notepad", "Word" etc. If you click on No a window opens up allowing you choose the filename and file location.



Clicking on START starts the test. Any errors detected are shown as in the window below. Start Date/Time and Time Elapsed are also shown in their relevant boxes. Clicking on STOP will bring up the "Stop Test?" confirmation window. Test will continue until the Yes button has been clicked on, whence the Stop Date/Time will be shown in its relevant window.



ucERR – an uncorrectible error occurs when more than 8 bytes in 1 packet are in error. This overloads the RS decoder, meaning that the packet cannot be corrected and is effectively lost.

cERR – this indicates that a byte in a packet has been corrected by the RS decoder. Up to 8 CERR's may occur in 1 packet before it becomes an ucERR. Every occurrence of cERR is logged. If an ucERR occurs, no cERR's will be logged for that packet.

Sync Loss – this is flagged if sync is lost at any time during a 0.1 second interval by the MTR-9100. Hence if the input is removed for 1 second, the sync loss column would be increased by 10.

Maintenance & storage

Maintenance:

No regular maintenance is required.

Care however should be taken to ensure that all connectors are kept clean and free from contamination of any kind. This is especially important in fibre optic equipment where cleanliness of optical connections is critical to performance.

Storage:

If the equipment is not to be used for an extended period, it is recommended the whole unit be placed in a sealed plastic bag to prevent dust contamination. In areas of high humidity a suitably sized bag of silica gel should be included to deter corrosion.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Warranty & service

Equipment is covered by a limited warranty period of three years from date of first delivery unless contrary conditions apply under a particular contract of supply. For situations when "**No Fault Found**" for repairs, a minimum charge of $A100.00 will apply, whether the equipment is within the warranty period or not.

Equipment warranty is limited to faults attributable to defects in original design or manufacture. Warranty on components shall be extended by IRT only to the extent obtainable from the component supplier.

Equipment return:

Before arranging service ensure that the fault is in the unit to be serviced and not in associated equipment. If possible, confirm this by substitution.

Before returning equipment contact should be made with IRT or your local agent to determine whether the equipment can be serviced in the field or should be returned for repair.

The equipment should be properly packed for return observing antistatic procedures.

The following information should accompany the unit to be returned:

1. A fault report should be included indicating the nature of the fault
2. The operating conditions under which the fault initially occurred.
3. Any additional information which may be of assistance in fault location and remedy.
4. A contact name and telephone and fax numbers.
5. Details of payment method for items not covered by warranty.
6. Full return address.
7. For situations when "**No Fault Found**" for repairs, a minimum charge of $A100.00 will apply, whether the equipment is within the warranty period or not.

Please note that all freight charges are the responsibility of the customer.

The equipment should be returned **to the agent who originally supplied the equipment or, where this is not possible**, to IRT direct as follows.

Equipment Service
IRT Electronics Pty Ltd
26 Hotham Parade
ARTARMON
N.S.W. 2064
AUSTRALIA

Phone: 61 2 9439 3744 Fax: 61 2 9439 7439
Email: service@irtelectronics.com

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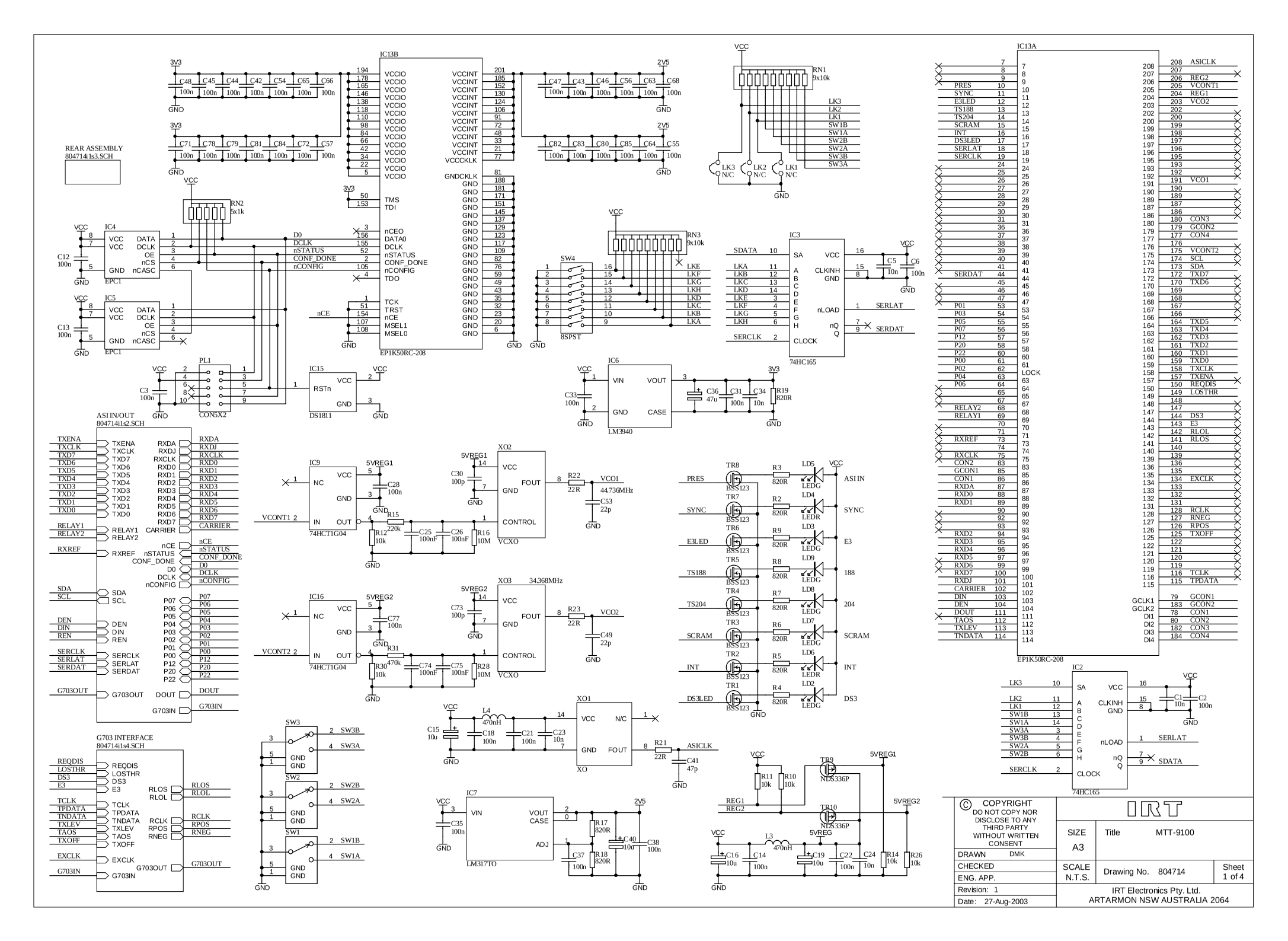
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9x10k
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RN3
9x10k
IC4
EPC1
IC5
EPC1
SW4
8SPST
IC3
74HC165
IC2
74HC165
PL1
CON5X2
IC15
DS1811
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LM3940
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TR1
TR2
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TR5
TR6
TR7
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TR10
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IRT
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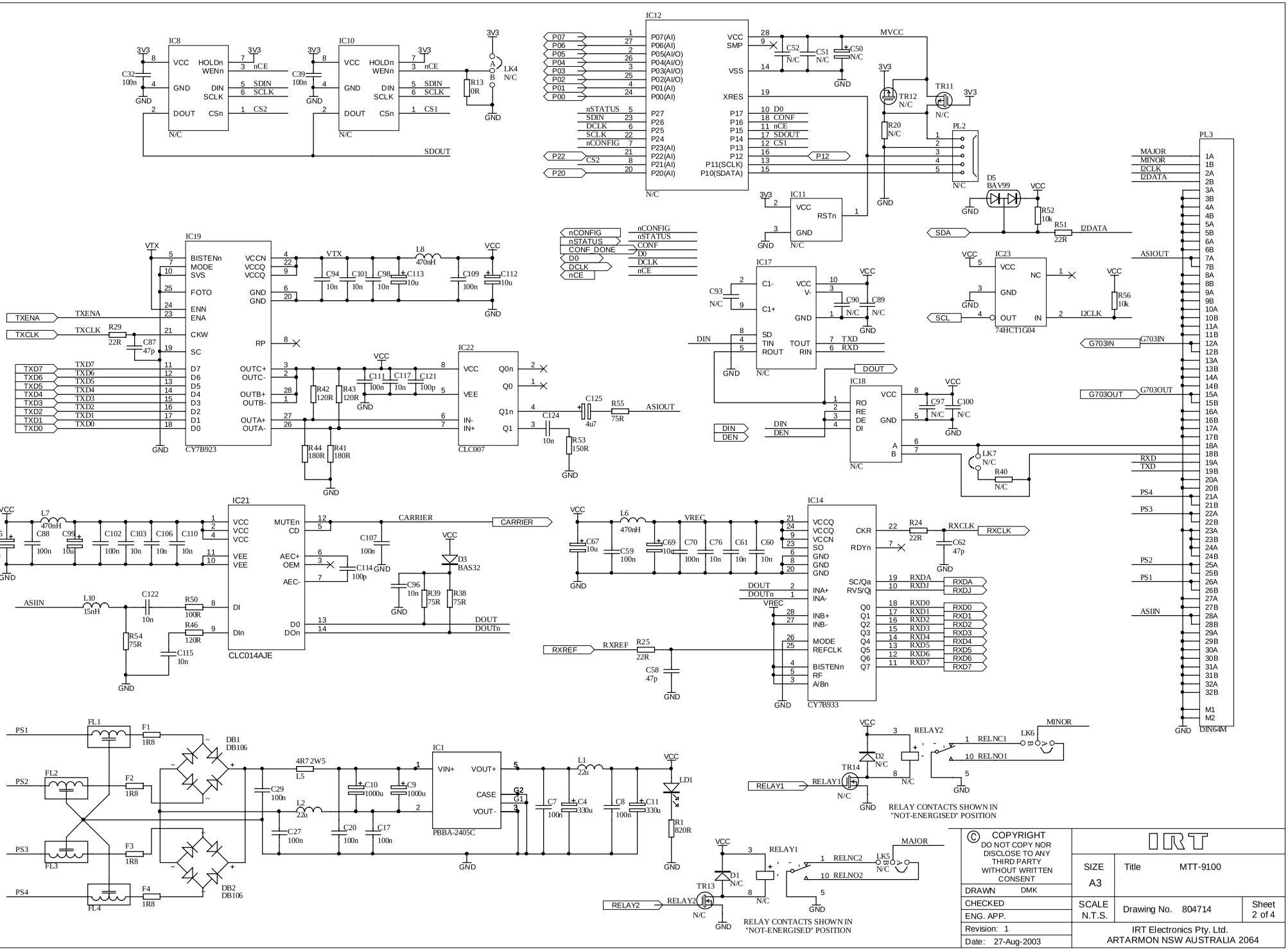
Title MTT-9100
DRAWN DMK
CHECKED
ENG. APP.
Revision: 1
Date: 27-Aug-2003
SCALE N.T.S.
Drawing No. 804714
Sheet 1 of 4
IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



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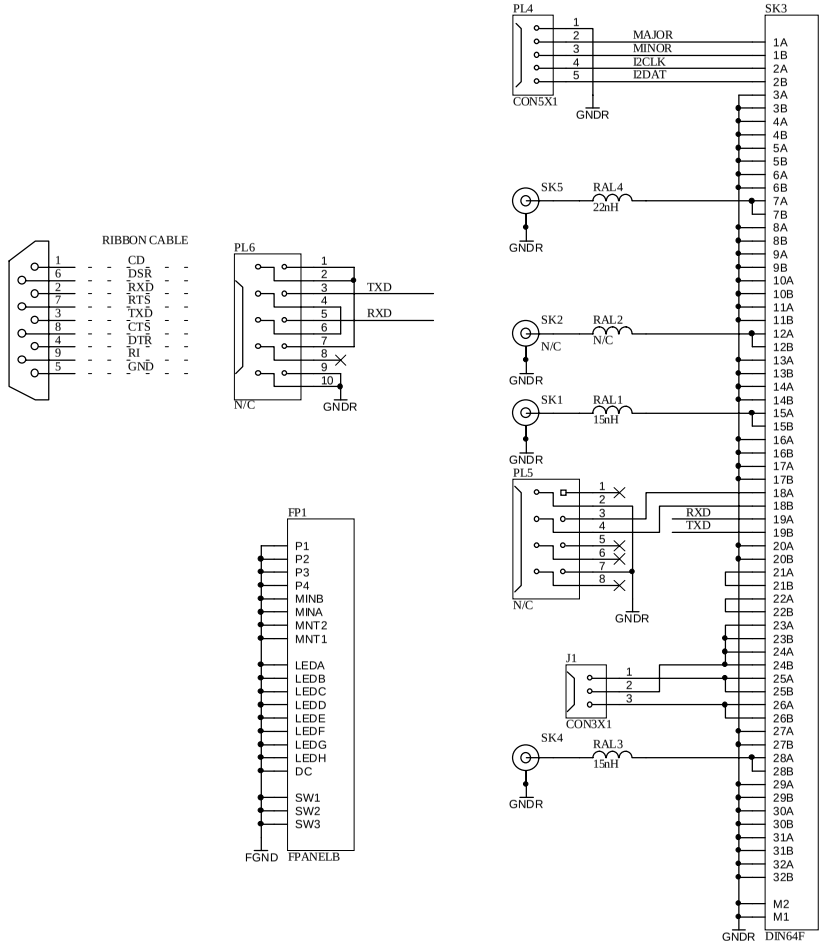
Date: 27-Aug-2003			



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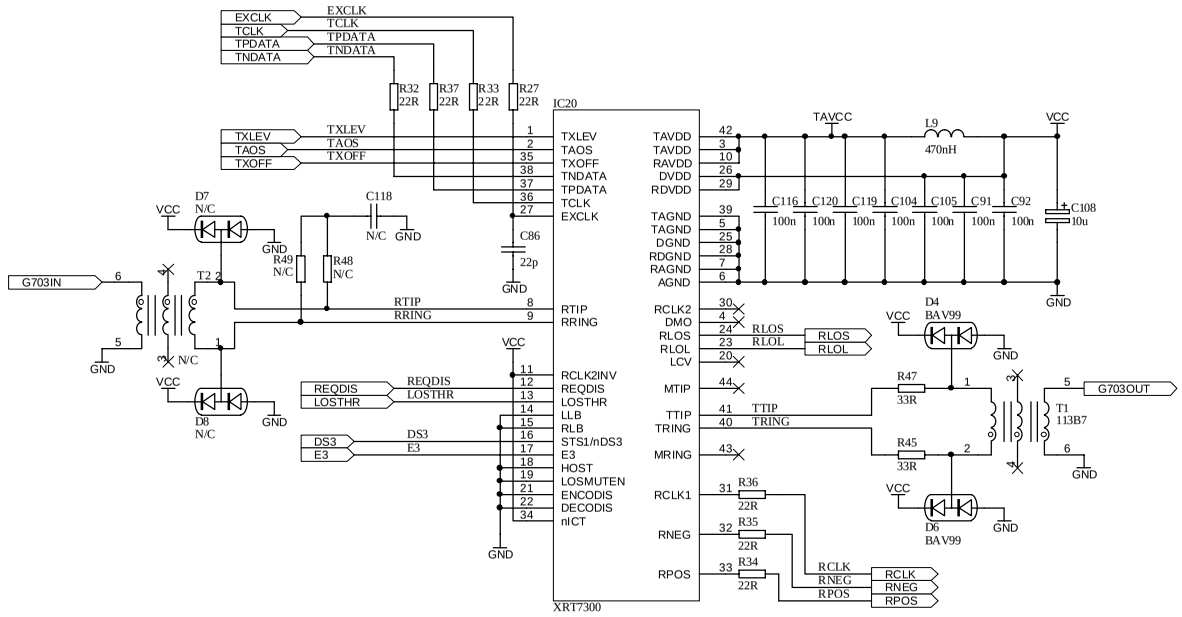
Date: 27-Aug-2003		



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ENG. APP.			
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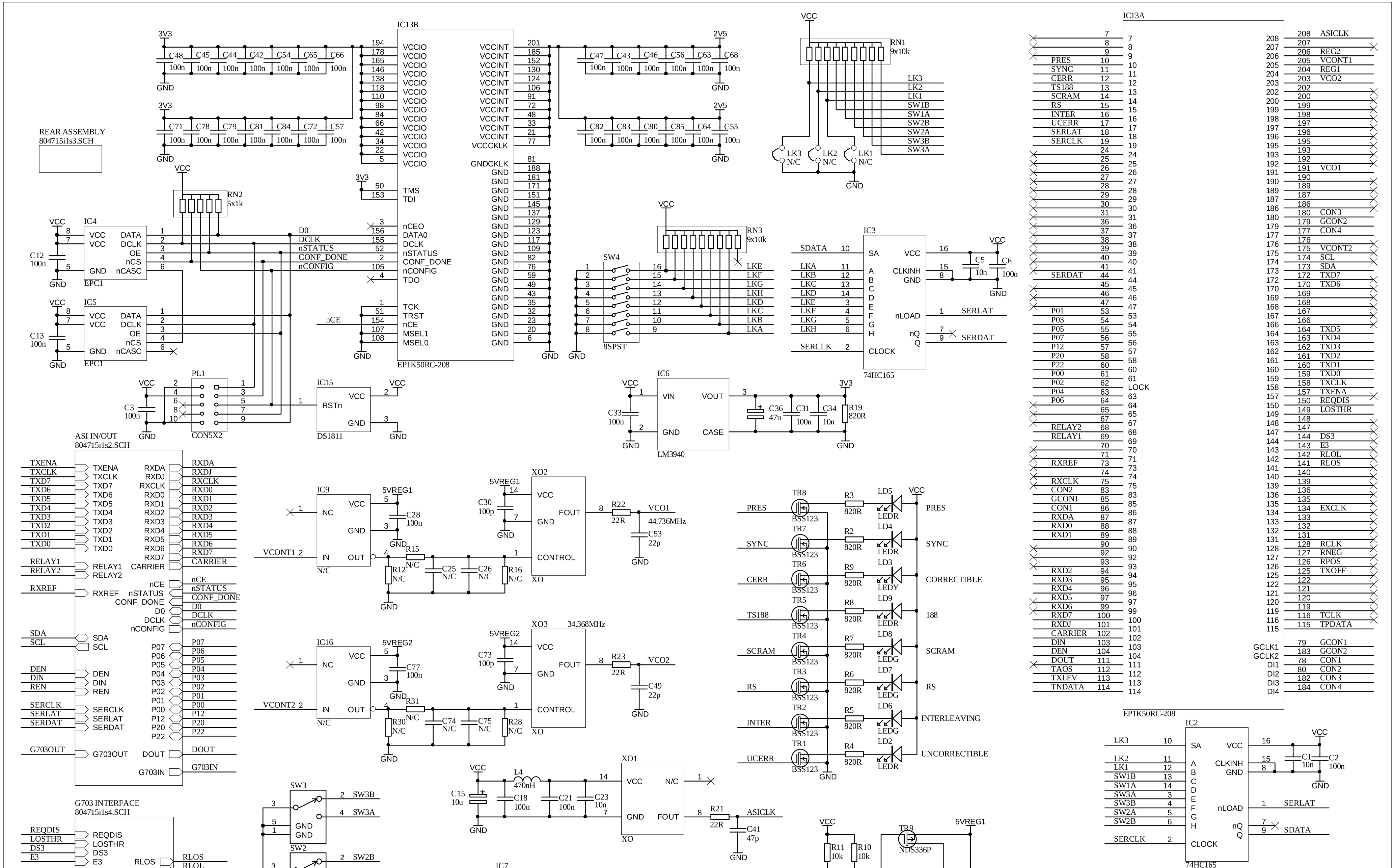

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ENG. APP.				
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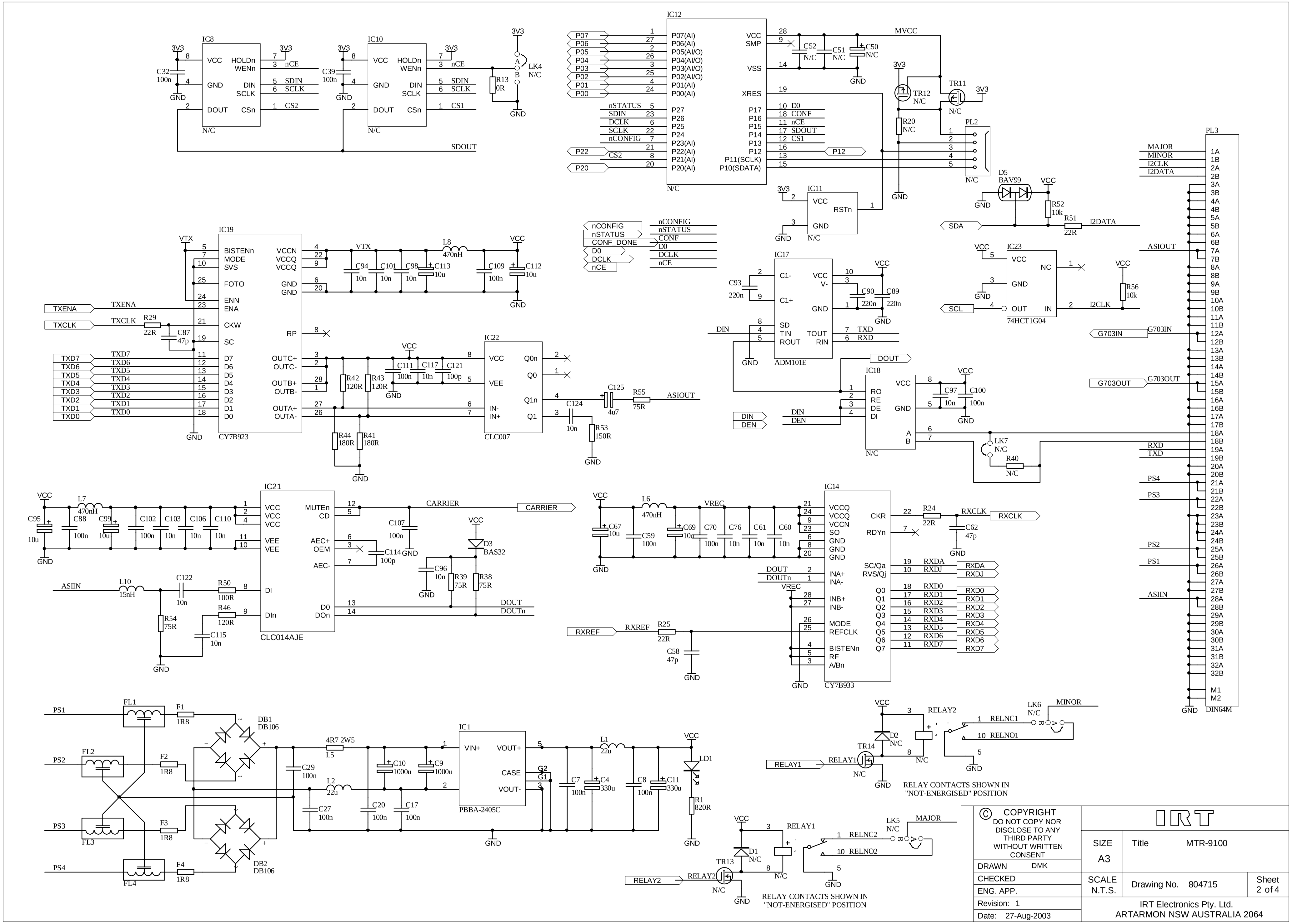

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SCALE	N.T.S.
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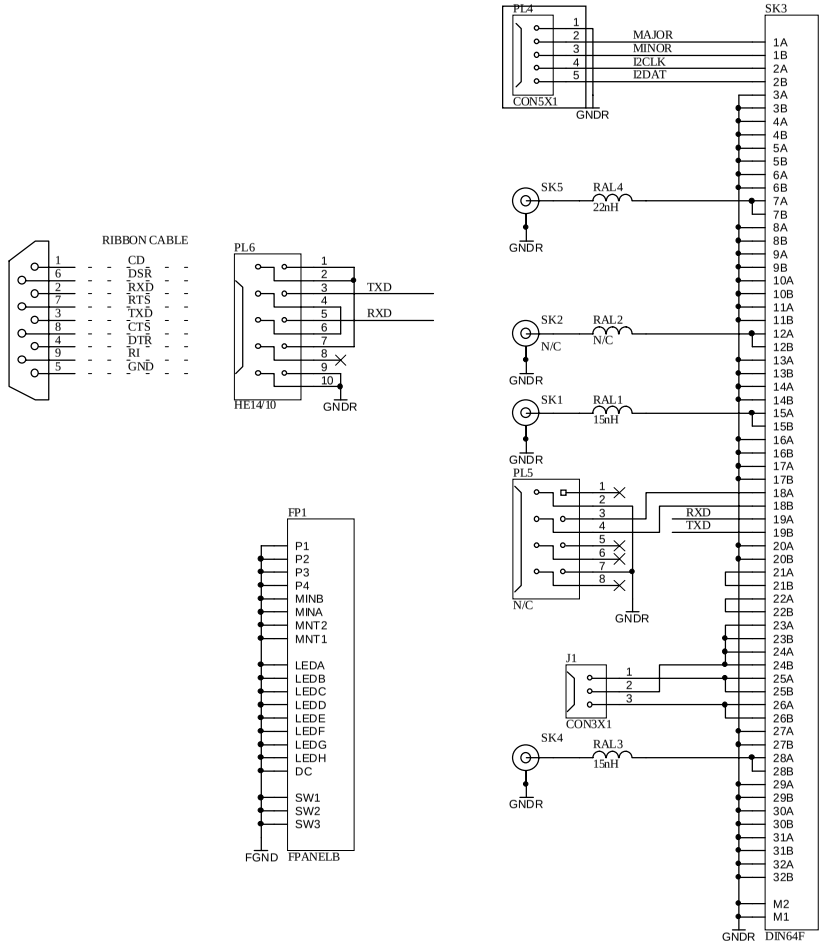

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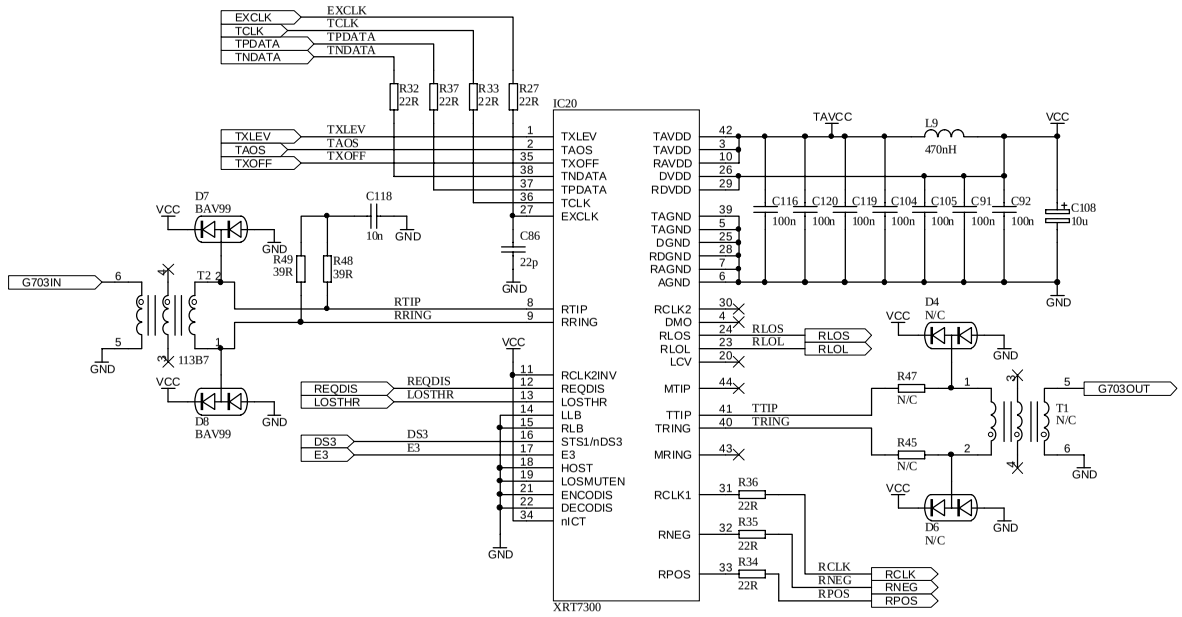

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